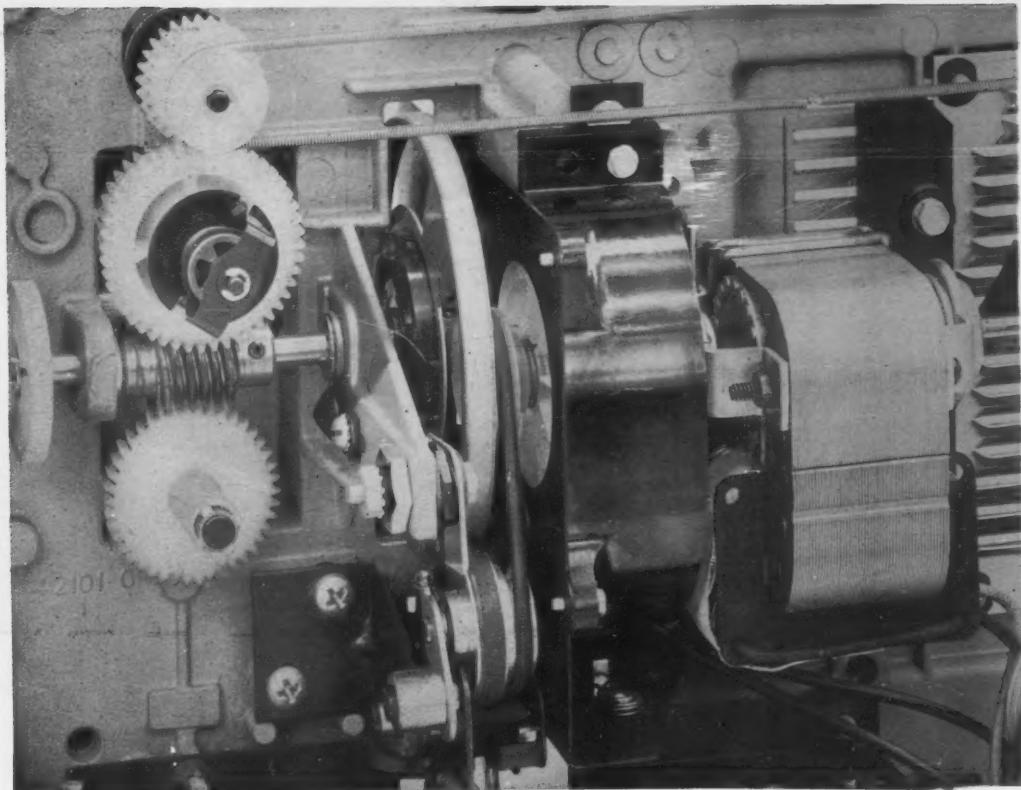


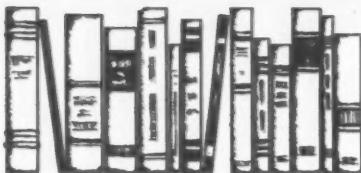
VOLUME 7
NUMBER 1
JAN-FEB 1961
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the

CAMERA CRAFTSMAN



In this issue:
TESTING LENSES
SPACE PIONEER



BOOK SHOP

Here are useful additions to your library of technical material. This department will regularly offer suggestions for new books you may wish to acquire. Any reference books, whether or not here listed, photographic or otherwise, will be located for you and may be purchased through the NCRS Supply Department.

FLASH ULTRA HIGH SPEED PHOTOGRAPHY By H. Edgerton and J. Killian	\$6.50
PHOTOGRAPHIC OPTICS By Arthur Cox	5.75
PHOTOGRAPHIC OPTICS By Allen R. Greenleaf	6.00
PRINCIPLES OF OPTICS By Hardy and Perrin	9.50
CAMERA REPAIRMAN'S HANDBOOK	5.95
KODAK REFERENCE HANDBOOKS	ea 4.00
MINIATURE AND PRECISION CAMERAS By S. J. Lipinsky	7.95
DICTIONARY OF PHOTOGRAPHY By A. L. M. Sowerby	10.00
PHOTO DICTIONARY By Morgan & Morgan	3.50
KODAK GRAPHIC ARTS HANDBOOK	6.50
PHOTO-LAB INDEX By Henry M. Lester and John S. Carroll	19.95
FOCAL ENCYCLOPEDIA OF PHOTOGRAPHY	20.00
THEORY OF THE PHOTOGRAPHIC PROCESS By C. E. K. Mees	21.50
_SOUND BASICS By Alexander Efron	1.25
LIGHT BASICS By Alexander Efron	1.50
BASIC ELECTRONICS By Van Valkenburgh, Nooger, Neville, Inc. 5 vols. \$2.25 each Hard bound edition	set 10.00 11.50
HOW TO INSTALL AND SERVICE INTERCOMMUNICATIONS SYSTEMS By Jack Darr	3.00
HOW TO SERVICE TAPE RECORDERS By C. A. Tuthill	2.90
AIC's OF CAMERA REPAIR By S. L. Love	3.95
BASIC ELECTRICITY By Van Valkenburgh, Nooger, Neville, Inc. 5 vols. \$2.25 each Hard bound edition	set 10.00 11.50
PHOTOGRAPHIC LENS MANUAL By C. B. Neblette Paper bound Cloth bound	1.95 3.50

the

CAMERA CRAFTSMAN

VOLUME 7
NUMBER 1

JAN-FEB 1961

The Periodical of Photo
Technology for Camera
Repairmen

NOTE: NO NOV.-DEC. ISSUE PUBLISHED
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THIS MONTH'S COVER

DRIVE COMPONENTS OF THE ARGUS M-500
MOVIE PROJECTOR

STAFF

Clair H. Schmitt	Editor
Fred Platts	Assistant Editor
Joy Roland	Associate Editor
Darwin Miner	Art Director
Frank H. Curtis	Advertising Manager
John Goldsmith	Production Manager

A Point to Ponder

By SAMUEL L. LOVE



Can you be a better camera craftsman without knowing more about rangefinder synchronization or light-meter balancing? You may not agree, but I think "yes."

The reasons are really quite simple. Look about you. In your community, there are doctors, perhaps. A druggist--maybe two. A shoe repair shop? Some service stations. Even a watchmaker and several other store keepers of various kinds. OK - now consider this. Wherever you need a service, the individual you choose is sought for more than his technical knowledge. Chances are, you can't even evaluate the technical knowledge. But what you can judge is how well you are known by the business man; how quickly he appears to understand your problem; his stature in the community; his interest in you as a person; in short, all the many little facets which, together, make up an individual's "business" personality.

It is obvious that a clerk can sell you a more suitable overcoat if he is concerned with your likes and dislikes. Similarly, though less obviously, you can do a better repair job if you are as concerned about the workings of your customer's mind as you are about the workings of the automatic film advance.

Do some people with whom you do business just seem to naturally have this "knack" of knowing people? Some do, but this can be considered as a skill to be acquired--just as important a skill as learning how to align the optics of a camera.

It starts, possibly, with real love of people. Such "love" comes easily with interest and investigation.

A good camera repairman becomes excited to the point of action about his community and the people in it. (Are you concerned about the way that your schools function? Do you like to pitch in and help paint the church? Do you know the members of your city council, or commissioners, or mayor well enough to agree or disagree with the way your city or county is run? Have you ever commented or made suggestions when a

Cont. page 4

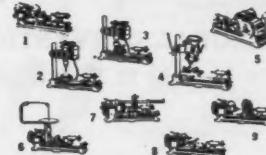
UNIMAT

Unimat is a precision tool designed for technicians and engineers. It's ready-made for Camera Craftsmen. No bigger than a typewriter, Unimat is a combination of 10 tools in 1 operating on just one base. Widely acclaimed as the finest tool ever developed for machining small parts made of metal, wood or plastic, Unimat is a rugged, portable machine that will provide a lifetime of satisfaction.



Basic unit consists of the precision lathe and all components necessary to set up drill press, milling machine, tool and surface grinding machine, hand drill, grinding and polishing machine. Also includes motor, upright steel drill press post, universal 3 jaw (reversible) self centering Cushman type lathe chuck, 3 jaw Jacobs type 1/4" capacity drill chuck, pivoting tool post, 2 dead centers. Face plate, lathe dog, grindstone arbor, Allen wrench, easy to follow instruction manual. Unimat basic unit comes handsomely packaged in sturdy wood storage chest. Complete basic unit, priced \$129.50

Item 1 through 5 are included in the basic unit. Items 6 through 9 are accessories. Write for illustrated literature and price list.



Attachments and accessories that turn Unimat into a complete machine shop: 1. Lathe 2. Drill Press 3. Tool and Surface Grinding Machine 4. Milling Machine 5. Polishing and Grinding Machine 6. Jig Saw 7. Threader 8. Circular Saw 9. Indexer and Divider.



You will work better when you see better with this new Binocular Magnifier. May be worn with or without eyeglasses. Leaves both hands free to work. Fine tolerance and precision work can be done easier faster and more accurately using this device. With the Micro-Focuser you see an object in three dimensions greatly magnified - with depth and clarity. It reduces eye-strain and prevents squinting - thereby saving time, increasing accuracy and minimizing the chance of errors and accidents. The head-band is adjustable for your comfort. Normal vision may be resumed by slightly raising your head.

Model No	2 magnifies 1-1/2 times at 20"	Price \$10.50
3	1-3/4"	14"
7	2-3/4"	8"
10	3-1/2"	4"
		12.50

No 13 and 17 are the same as No 3 and 7 with an auxiliary lens attachment which gives magnification of 4-1/4 and 5-1/4 respectively, with the right eye only. Priced \$15.00 each.

A ServiShops PRODUCT

Point to Ponder cont. from page 3
new budget was to be approved? Did you do anything more than vote in the recent election?

If you would be a good camera repairman, you may find that some of these activities will improve your skill; not necessarily for refinishing the leather of a camera, but certainly for providing a finished understanding of the camera's owner.

Some people think that a hobby is only a means of "getting away" from the humdrum of daily life. There is no question about its value there, but whether you enjoy climbing a mountain or leading a Boy Scout troupe, collecting antique firearms or listening to rock-and-roll music, building a model railroad or reading a Longfellow poem, your shared hobby can develop insights into human relations that would otherwise be as distant as the moon.

There are other, perhaps more obvious activities that you can consider important to your growth as a Camera Repairman. Be a member of the Chamber of Commerce? Of course. Serve, don't simply visit the camera clubs in your community. Be a Photography Merit Badge Counselor, or 4-H leader, or even guide an adult class learning to take pictures at the local high school.

Make no mistake. You can not continue to grow as a Camera Repairman unless you constantly learn more about your field. But learn to know and like people also. Prove it by serving them and you can not help but be a better man and craftsman.

NATIONAL CAMERA REPAIR SCHOOL Englewood, Colo.

Cordially invites you and your associates
to visit our exhibit at the

Master Photo Dealers' and Finishers' Association's
37th annual

NATIONAL CONVENTION AND PHOTOGRAPHIC TRADE SHOW
to be held in Philadelphia on March 12, 13, 14, 15, and 16, 1961.

Booth 1014

"REMEMBER WITH PICTURES"



Reports FROM THE CRAFTSMEN

In checking my accounts (for last year), I repaired over 350 cameras and as yet I haven't received a complaint on my work.

William Justice
Miamisburg, Ohio

I am doing the camera repair work for a Glendale Camera Store, and I realize more each day just how much the training in NCRS really means and how thorough the course was. I have had to improvise, file, cut and saw on some of the jobs thus far.

My first job handed to me was a "Voigtlander Prominent" with shutter trouble. This camera has a double shutter, and was returned by the repairman who had been doing their work as "unable to repair - return to factory". I will admit, I was somewhat frightened with this as my first job. I knew I had to do it - and do it right! So I wrote a letter to Mr. Clair Schmitt regarding disassembly - this I got - plus a lot of encouragement - and let me say here - I think Mr. Schmitt is tops - he has always come thru with clear, concise answers that made the job easily understandable.

Russell C. King
Youngtown, Arizona

I am servicing the local camera shop where I was welcomed as a long sought for service. We are planning some future promotions which should help us both. Thanks again for your part in this venture.

Don Lindsey
Plainville, Conn.

The work is really coming into the shop now -----if I had never met any of you personally I wouldn't have believed that such wonderful people existed. I will never forget the wonderful visit that I had with you and the knowledge that I gained in the few short days that I was in Englewood. I can never thank all of you for everything that you have done for me starting me on a new career that is so rewarding, and it brings so much peace of mind. I believe that because of you I have found my niche in this world.

Gene Warnke,
Grand Rapids, Michigan



IN YOUR WORKSHOP: Tap-A-Line permits you to plug in soldering irons, test lamps, flex shaft, other equipment. Has them all ready and available for immediate use.

IN YOUR STUDIO: Tap-A-Line is convenient for portable lights, flood lights, spot lights.

On Your Test Bench:
Tap-A-Line will permit you to plug in all types of flash cords and have them at your finger tips.

Model TL 1 foot \$2.00

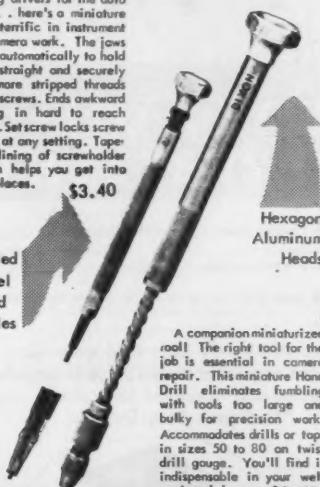


Dixon Miniaturized Tools

You've seen handy screw-holding drivers for the auto trade . . . here's a miniature that's terrific in instrument and camera work. The jaws adjust automatically to hold screw straight and securely --no more stripped threads or lost screws. Ends awkward groping in hard to reach places. Setscrew locks screw holder at any setting. Taper-streamlining of screwholder section helps you get into tight places.

\$3.40

Knurled
Nickel
Plated
Plated
Handles



A companion miniaturized tool! The right tool for the job is essential in camera repair. This miniature Hand Drill eliminates fumbling with tools too large and bulky for precision work. Accommodates drills or tops in sizes 50 to 80 or twist drill gauge. You'll find it indispensable in your well equipped shop.

\$3.50

▲ ServiShops PRODUCT

CIRCUITRACER

A small dependable rugged tester



• • •

An easy to use, inexpensive electric circuit tester especially adaptable for camera repair work. It is capable of locating and identifying dead or live circuits of any voltage, fast.

- Checks electric photo-flash circuits
- Analyzes breaks and high resistance joints
- Tests flash wiring for breaks or bad connections

Put this handy unit into your carryout case or pocket for quick tests anywhere. Tested and approved for camera repair by "National ServiShops"

\$4.50

A ServiShops PRODUCT

Birth Daze



"Feeding time between lessons"---New baby girl born October 14 at 5:48 p. m. to Mr. and Mrs. R. C. Sullivan, Memphis, Tenn. Baby's name "Rima Gail," weight, 7 pounds, 7 oz., 20 1/2" long.

Mr. and Mrs. William Turley, Jr. from Ithaca, New York have a new daughter. We don't know her weight or birth date but it's likely Bill's lessons will have some competition for a while.

Lawrence Sherman, from New York, announced a tardy lesson and an on-time baby boy---7 pounds, 12 ounces, born in November. It's these "little interruptions" that slow up studies isn't it?

STUDENTS RESPOND TO PLEA

We ran a story in the July-August issue of the Camera Craftsman about Mr. R. T. Kanemori in Hilo, Hawaii. He had 10 years hard work destroyed in minutes by the tidal wave which struck there in May. His camera business was destroyed, building and all. He appealed to National Camera for help in supplying him with tools so he might be able, at least, to continue his camera repair business until he could start his complete business again.

We promised to help him and pass his appeal on to you. We were very happy to see the response by many of you. Bill Carn, from New Zealand, felt that anyone with the drive to want to continue after such a blow deserved help. He sent \$20 to be credited to Mr. Kanemori's account.

Another student, Mr. Thomas Mausolff from Pennsylvania had another idea. Feeling that the main problem for Mr. Kanemori would be finding some credit or a loan to get his business

Cont. page 7

going again, he suggested that *Craftsman* readers lend him \$10 for one or two years without interest. He said if a good number were to do this, it would make up a worthwhile total with no great expense on the part of any one person. To start the ball rolling, he sent \$10.

Many other students, we're sure, have helped Mr. Kanemori without us knowing about it. It's satisfying to see the response of people like Bill Carn, and Tom Mausolff to a fellow camera repairman in trouble.

MPDFA CONVENTION SPEAKERS

General session speakers at this year's MPDFA National Convention in Philadelphia, March 12-16, will cover topics of importance and interest to all conventioners.

Lead-off speaker at the Monday, March 13th, General Session will be Dr. G. Herbert True, vice-president of Visual Research in Chicago. Dr. True will talk on the subject of "New Horizons For Sales" in the photographic industry. He is a well-known writer and research psychologist, and has become renowned for his interesting, educational, and enlightening talks.

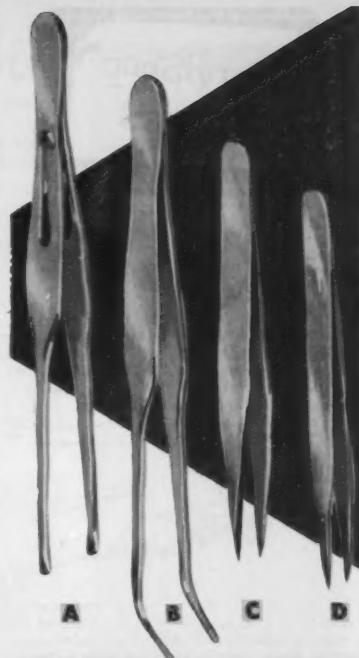
Robert A. Schaefer, vice-president of Technicolor Products, Inc., will give an: "Appraisal Of The National Photographic Market" at the Tuesday General Session.

Splitting this session with Mr. Schaefer will be MPDFA's Executive Manager, R.J. Wilkinson. He will talk on, "Who's Running Your Business." For several months the MPDFA staff has been working on a project that will give the photographic dealer an efficient tool to aid him in combating the discount problem in photographic sales. A parallel plan will also be available for photo finishers. Complete details of these proposed programs will be presented by Mr. Wilkinson.

A specific market which is too often overlooked, the women's market, will be discussed by Miss Lorna Opatow, research director of Good Housekeeping magazine, at Wednesday's General Session. She will cover "How to Sell The Women's Market" and outline specific approaches that may be taken to make photographic products more attractive to the woman buyer.

Sharing this last General Session of the Convention with Miss Opatow will be K.O. Richardson. He will discuss the proper method to "Feed The Goose That Lays The Golden Egg." Mr. Richardson is manager of the photo finishing sales division of Eastman Kodak.

For further information, contact the Association at 104 E. Michigan Ave., Jackson, Michigan.



RENARD TWEEZERS

Designed for working with small parts in tight places. Where you can't use your hands. Swiss made, long lasting, chrome plated.

A-Soldering	-----	.85
B-Clock	-----	.58
C-Assembly	-----	.85
D-Work	-----	.30

All Sizes Available

A ServiShops PRODUCT

ServiShop ITEMS



Now packaged in convenient 7cc applicator guns, NCRS Supply has two of the finest instrument lubricants available. Use All-Temp Lube for sliding levers and similar friction points. Use Moly Lube on motion picture camera springs.

All-Temp Lube 60
 Moly Lube 70



Fine instrument lubricants are now packaged by NCRS in 5cc disposable syringes. Keeping oil clean yet instantly available for pin-point application, these containers are perfectly suited to bench technicians.

5cc Instrument Lubricant 55



SHINO Polishing Cloths
 Two cloths - one with jewelers' rouge, the other for final polishing. Comes in cardboard box.
 11-1/2" x 14" size. Each. 75



Non-corrosive, resistant to temperature change, this Porpoise Jaw oil product stays at the point of lubrication.
 3/8 oz. bottle 75

Congratulations TO NEW NCRS GRADUATES

Graduation time represents the culmination of studies completed over a period of from one to three years. In many cases this achievement was made under heavy pressures from regular job and family responsibilities. All of these NCRS graduates deserve the highest praise for the diligent attention and unflagging work that went into their course of training.

Jane Campbell
 William R. Carter
 Clarence Thomson
 Sanford L. Peck
 Ted J. Rozak
 Cecil M. Howard
 Emile L. Jarrard
 Charley W. Herrington
 Patrick O'Malley
 Horst Junger
 Raymond E. Warnke
 H. Edward Wilkers
 John R. Richards
 E. N. Grunfeld
 Calvin C. Fehrenbach
 Robert S. Wilson
 Donald R. Clark
 Charles Schickel
 Charles Hullman
 William W. Sanks, Jr.

Illinois	Massachusetts
California	Kansas
Kansas	Washington
Washington	California
California	Virginia
Virginia	Mississippi
Mississippi	Michigan
Michigan	Canada
Michigan	Michigan
Massachusetts	California
California	Colorado
Colorado	California
California	Virginia
Virginia	Connecticut
Pennsylvania	Pennsylvania
Pennsylvania	California
California	Canada
Canada	Washington

These men received Certificates of Completion
 Lucien Vaillancourt
 George W. Bower

LEICA FAN WANTS OLD LEICAS

Orlando Florida has a real Leica fan. Jim Forsyth is collecting all he can that has anything to do with, as he puts it, "his beloved Leica". He already has a considerable library of just about every book that even mentions the Leica and is interested in old Leica's, especially those with low serial numbers. He's also looking for pre-war accessories, or any literature dealing with the Leica.

In addition to his library, he also has plans for the formation of an International Leica Society, which would sponsor a museum. If you're a Leica fan too, or if you have something he might be interested in, contact Jim at Box 2222, Orlando, Florida.



study shots

HERE IS WHERE NCRS STUDENTS LEARN

These are pictures of students in the shops they have set up for their training in camera repair.



B. L. Stevens
Aurora, Colorado



Virginia Champlin
Wakefield, R. I.



Frederick Fyfe
Jacksonville, Fla.



Carl Reinius
LaMesa, California



William Pomeroy
Traverse City, Mich.



Gene Maser
Long Beach, California



Dennis Thibedeau
Willmar, Minnesota



Ronald Hare
Niagara Falls, N.Y.



James Jackson
Fort Wayne, Indiana

America's Space Pioneer



Dr. Goddard's Liquid - Fuel Rocket

A huge rocket thunders from its launching pad at Cape Canaveral to hurl a man-made moon into orbit.

It is ironic that so dramatic a breakthrough in man's ancient yearning to explore the reaches beyond his own planet should have originated nearly half a century ago in the scholarly mind of a brilliant, self-effacing American physicist, stigmatized in his own time, except by a few far-sighted people, as a "visionary" and "moon-man."

Tragically, Goddard lived only long enough to see his dream of man's conquest of space come to fruition in the form of a terrible new weapon -- the German V-2 rocket--in the hands of an enemy.

In May, 1945, only three months before Goddard's death, captured German rocket experts were asked by U. S. Army special-

ists about the V-2's that rained death on London in the last months of World War II. To the Americans' surprise, a member of the German delegation replied:

"You have the man in your country who knows all about rockets, and from whom we got our ideas--Robert H. Goddard."

Among other advances, Goddard was the first man to:

- Develop (in 1918) a projectile rocket, prototype of the World War II "bazooka" and forerunner of present solid-fuel rockets.
- Develop and shoot a liquid-fuel rocket (March 16, 1926, at Auburn, Mass.).
- Shoot a rocket faster than sound (1935, near Roswell, New Mexico).
- Develop a gyroscopic steering apparatus for rockets.
- Patent the idea of a "step" or multi-stage rocket.
- Offer a practical plan to explore high altitudes with rockets, and possibly shoot away from the earth.
- Offer the first sound mathematical theory of rocket propulsion and flight.
- Prove, mathematically and by actual test, that a rocket operates more efficiently in a vacuum, and so can operate in space.

Goddard's records, carefully kept through the years, reveal the exhaustive labors that went into one momentous breakthrough after another. They also reveal disappointments which would have discouraged less optimistic and happy man than Goddard. Typically, in the midst of a difficult research problem, he once said to his wife: "If it were easy, someone would have done it long ago."

When the United States entered World War I in 1917, Dr. Goddard volunteered his services and was assigned to explore the military possibilities of rockets. He developed trajectory rocket which fired intermittently, with charges injected into the combustion chamber like cartridges in a repeating rifle. He also developed several types of projectile rockets to be fired at tanks and other objectives from a launching tube held in the hands and steadied by two legs.

These weapons were demonstrated to representatives of the Signal Corps, Air Corps and Army Ordnance at Aberdeen Proving Grounds on November 6 and 7,

Cont. page 13

LITTLE CHANGE FOR FUTURE SHUTTERS

Waldemar Rentschler, assistant director and design chief for a West German shutter manufacturer, says the shutters used in the newest semiautomatic and fully automatic cameras will be the "latest" for some time to come. Rentschler said, "Shutter designs have arrived at the limit where it is no longer possible to advance technically at reasonable price, nor does such alteration appear desirable." "With today's films, a fully automatic camera with a shutter speed of 1/100 second is just about all that can be wanted or used by the great majority of amateur photographers."

There are five times as many farm people in Russia as in the US. Even so, Russian farmers just barely manage to feed the country's population. American farmers produce so much that surplus crops are one of the country's problems.

This explains why Russia, with all its vast population, has only 53.4 million workers left for all the jobs off the farms. For the same kind of jobs, the US (with 32 million fewer total population) has 62.8 million.

US News & World Report

MASTER MECHANIC STAR SALESMAN SKILLED AIDE

Here's the triple-threat test instrument that will be equally at home in your shop, store or lab. This investment is planned to earn you profits. Use the prestige-building

ServiShops Motion Analyzer

for fast, high-precision tests on all photo equipment. You'll find it easy to operate, easier to understand and easiest to demonstrate!

NATIONAL CAMERA REPAIR SCHOOL

Drawer CC

Englewood, Colorado

**Use Kimwipes
on your
camera
bench...**



SAFE!
SOFT!
CLEAN!
DISPOSABLE!
NON ABRASIVE!

Kimwipes special design captures grit
and dirt in the crepe pockets to protect
such highly polished surfaces as camera
lenses and binoculars.

4 Boxes...\$1.35

12 Boxes...\$3.45

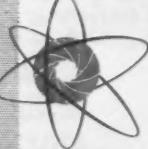
A ServiShops PRODUCT



Write today for complete,
free information.

**EXPERT
CAMERA
REPAIR
SERVICE**

• Authorized agency
NATIONAL CAMERA
ServiShops



• ALICE'S CAMERA CRAFTSMAN
Englewood, Colorado

This colorful sign will tell your customers that you want their camera repair work. The sign is done in eye-catching yellow, blue and black on white background. The size is 11" by 14".

A sign for every purpose. Standard heavy board, standard heavy board with easel, and paper that can be taped to any window.

Price each in quantity	1-4	5-9	10 up
Paper	.90	.70	.50
Board	1.00	.80	.55
Board with easel	1.10	.90	.65

May be ordered for quantity price. One sign is FREE. 25¢ in cash or stamps for handling and postage. No handling charge for your free sign if you order more than one.

**NCRs
Lesson
Binders**



Now you can keep all of your texts neatly in order. Each text is held securely and the binder may be opened to any page in any text, yet each is instantly removable! Seven inches wide, your binder holds forty texts ready for immediate reference. This is a fine way to preserve your Camera Craftsman-ship lesson books.

Price only \$7.75

A ServiShops PRODUCT

If Your NOT a Member of SPT,...

THE NEXT SECTION OF THIS ISSUE IS MISSING



The Society of Photo-Technologists section of the Camera Craftsman is sent only to members of the society. SPT is an organization composed of camera technicians and others interested in the more technical aspects of photography. This section contains varied technical material available only to members. Send for an application so you won't miss the valuable articles in this section.

Address: The Society of Photo-Technologists
Box 174
Englewood, Colorado



The new ServiShops Motion Analyzer. Though impressive and complex in appearance, it is easily used. In six seconds it tests the operation of any still or motion picture shutter and flash synchronization device. The test is made completely visible to both the customer and sales person by means of a five inch cathode ray tube.

SPT

THE SOCIETY OF PHOTO-TECHNOLOGISTS

SPT NEWS

S. L. Love, President of SPT, has announced the appointment of chairman and members of the following standing committees.

The Honors Committee determines honors to be bestowed upon members and non-members of the Society. The chairman is Wyon L. Bonar, from Quincy, Illinois. His committee members are Clair H. Schmitt, Englewood, Colorado; Chester Crumrine, South Bend, Indiana; and Chu Siew Kit, Singapore, Malaya.

The Planning Committee is designed to make recommendations of Society action and industry-wide development as suggested by members of the Board of Directors. The chairman is A. Neal Winner of Williamsport, Pennsylvania. Members of his committee are Eugene Fowler, Denver, Colorado; Roy Hannan, Aliquippa, Pennsylvania; Norman Menck, Cleveland, Ohio; and Donald R. Cole, Port Jervis, New York.

The Editorial Committee is headed by Frank Mitchell, of Lewiston, Maine. This committee handles the various publications of the Society. Its members are Lloyd Mahoney, of Boston, Massachusetts, serving as vice chairman; Stanley Barrowski, Regina, Sask., Canada; Woodrow West, San Francisco, California; and Art Reynolds, Swampscott, Massachusetts.

The Public Relations Committee is responsible for the active promotion of the Society. Jane Campbell of Coal City, Illinois, is chairman and members are L. V. Mangold, Grafton, Wisconsin; John J. Weisse, Yonkers, New York; Walter Reedy, Tulsa, Oklahoma; and Walter J. Husband, of Hesperia, Michigan.

The Membership Committee, responsible for the recruitment of new members is chaired by Earl W. Tolbert, Denver, Colorado. Members of the committee are Julius Adams, Thibodaux, Louisiana; John Joyce, Royal Oak, Michigan; Rea McFayden, Seattle, Washington, and Gene L. Clark, Hawthorne, California.

In addition to establishing committees, Mr. Love announced the availability of SPT insignia pins. These attractive blue enameled insignias (on a sterling pin) are available from Executive Secretary, Dorothy Romer, 900 W. Chenango, Englewood, Colorado, at a cost of \$3.00.

PRINTED WIRING and REPAIR

This is the last in a series of three articles to appear in the Camera Craftsman about the repair of printed circuits as developed by DuMont - a pioneer in the field.

Equipment and Materials

A. The soldering iron to be used in this repair procedure has to have certain characteristics. The iron must have the following requirements:

1. Tip temperature must not rise above 600°F to maintain proper soldering control. Excessive heat will cause solder to melt completely down through the eyelet and create an unreliable connection on the component side of the chassis.
2. Tip temperature must be above 500°F to assure adequate heat for proper fusion, and to permit making the repair rapidly enough to avoid over-heating the materials adjacent to the eyelet. Such over-heating will cause destruction of the adhesive bond between the copper conductor and the phenolic base laminate; i.e., blistering of the conductor or within the laminate itself will occur.
3. The tip length must be adequate to facilitate access to the socket connections and between wire leads and components. Tip extension should be between 2 to 2 1/2 inches. The semi-chisel or screwdriver shaped tip affords good conduction and the least obstruction of the work area.

B. The cored solder to be used for this process is Kester #44 flux cored solder, specified as follows: 1/16" diameter, 63-37 alloy, #40 core size and #44 type flux. This solder has been specified for the following reasons:

1. The 63% tin-37% lead alloy is a low melting alloy and has a very short melting temperature range. "Freezing" will occur as soon as the temperature drops below 360°F.
2. The #40 flux core contains .5% flux by weight -- an amount adequate for complete fluxing; yet it will not produce an unsightly ring of resin around each resoldered eyelet.
3. The size, 1/16" diameter, is adequate for a good rate of operation and is small

Cont. page 2

Printed Wiring cont. from page 1
enough to maintain control of the amount
of solder being applied.

4. The Kester #44 flux provides good wetting
on all but badly oxidized or contaminated
surfaces.

Warning: Use of any other solder-flux
combination for this procedure
is not recommended.

C. Solvents for use in cleaning the chassis prior
to resoldering and for flux removal are limited
to the following: Isopropyl Alcohol or LN-10
Flux Remover (manufactured by the London
Chemical Company, Melrose Park, Illinois).
LN-10 Flux Remover may be used in cleaning or
for flux removal. It is claimed to be "non-
flammable and non-toxic".

D. Acid brushes or similar stiff bristled brushes
should be used with solvents for cleaning and flux
removal.

E. Clean, absorbent cloths for blotting up sol-
vents.

F. Watchmaker's loupe or magnifier to detect
the presence of cracked joints.

Preparation

Both sides of each printed circuit chassis
must be accessible for resoldering and cleaning.
The dip side of the chassis shall be cleaned, if
necessary, to remove any dust, wax, or other
soils which will reduce solderability. Solvents
must be used sparingly and must not be allowed
to contact the following components: variable
resistors, precision resistors, and Sprague
wire-wound resistors. For soldering, the
chassis shall be positioned horizontal within 15°
and supported to provide a firm working area.

Soldering

The procedure outline below must be followed
exactly for reliable and uniform results. Figure
4 represents an ideal resoldered joint.

At those joints already outlined, apply the
solder iron tip to the junction of the eyelet and
pad or eyelet and tube socket tab. Simulta-
neously, apply solder to the junction of the eye-
let and the solder iron tip. With solder being
fed to the eyelet in this way, heat will be con-
ducted into the eyelet through molten solder as
well as through the contact point of the iron tip.
Do not permit the iron tip to contact the phenolic
board or the printed conductor outside the pad
area. Feed enough solder to build up a deposit
which will completely cover the eyelet and flow
over the pad area. See Figure 4.

Keep the iron tip in contact with the work only
long enough to complete the build-up process.
Withdraw the iron immediately after solder flow
around the eyelet is complete. If the tip temper-

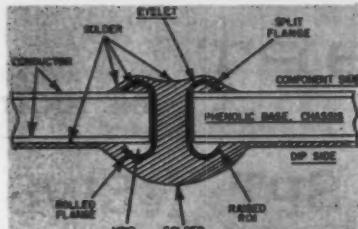


Figure 4. Resoldered eyelet, rolled flange.

ature is close to 600°F it may be necessary to
withdraw the iron just before complete flow
occurs.

Observe The Following Important Precautions:

1. There must be no bubbling of solder during
application or after the iron has been
withdrawn. (Bubbling will leave pock
marks in the smooth solder surface.)
Bubbling is due to overheating and will
result in any one or all of several un-
desirable conditions:
 - a. Movement of solder in the eyelet and
adjacent areas at the time of "freez-
ing", as evidenced by bubbling, can
result in a cold solder joint.
 - b. Complete melting of solder down
through the eyelet, which may or may
not be evidenced by bubbling, can re-
sult in opening the connection on the
component side of the chassis between
the eyelet and conductor. Solder on
the underside of the chassis at a time
when it is partially molten and is
mechanically weak.
 - c. If bubbling or flow through of solder has
occurred, the operator must:
 - a. Wait until the joint has cooled.
 - b. Examine the underside of the eyelet
for fluxed solder. If an excess of
solder has accumulated, remove it
by draining with the iron and again
allow the area to cool.
 - c. If flow through has occurred, resolder
both sides of that eyelet, following the
above procedure, allowing the area to
cool after heating each side.
 - d. If flow through has not occurred, do
not disturb the underside of the eyelet
in question.
 2. Do not move or disturb component leads
or wires within an eyelet before the
solder has set. This movement will also
cause "cold" solder connections, an
everpresent source of intermittent con-
nections.

Measuring ← and Testing ← LENSES ←

by G. Barnstedt

Scope of article

This article describes a variety of measuring and testing procedures, which are chiefly employed in the testing of photographic lenses. It gives details of their accuracy and provides a summary of the principles of their applications. It also illustrates the full procedure involved in testing.

Introduction

The standards of quality demanded of industrial products have increased greatly in recent years. This naturally makes itself felt at the initial planning and design stages of such products, but it is in the manufacture that the greatest efforts must naturally be expended if the finished product is to ensure that degree of precision aimed for by the designer. The standards of quality obtained in the precision-mechanism and optical industries are particularly high. In order to check that these already high standards are observed, a wide variety of measuring and testing instruments are required, the accuracy of which must if possible exceed that demanded for the components that are used for testing. In many cases it is necessary to employ measurements accurate to a fraction of the wavelength of light, which, besides being of sufficient accuracy, must also be economically practicable.

A great number of these techniques have been known for many years; others have been developed under the stimulus of the need for ever-increasing accuracy, and are continually being improved. This report gives a survey of such measuring and testing techniques, with special attention to those employed in the manufacture of photographic lenses.

To gain an impression of the various tests which are necessary, it would be best first to describe briefly a photographic lens.

An objective lens is an optical system made up of separate lens elements, or, less frequently, of mirrors. It produces a real image of an object by refraction or reflection.

A lens element is a rotary-symmetrical body made of transparent, homogeneous organic or inorganic material (in the case of high-quality photographic lenses, of inorganic optical glass). They are generally bounded by spherical (or flat) surfaces, but occasionally may have aspherical surfaces. The rotary axis of all elements in a lens system must be on a straight line: this line forms the optical axis of the system.

The optical components are retained in metal mounts and, if built into a body, helical focusing mount or shutter, are generally provided with an iris diaphragm.

The design specifications of the optical elements are determined by means of elaborate calculations. Since it is unfortunately impossible to design a wholly-perfect lens which will form an absolutely accurate image of an object, the task of the computer is to keep the residual aberrations as small as possible. Then the mounts are designed and the working drawings prepared. After the preparatory design stage, the production prototype is made; only then can the quality of the design be determined. If these tests are satisfactory and the economic considerations warrant so doing, quantity production is then commenced after further extensive preparation.

It is essential to ensure that the qualities of the design can still be retained when the lens is produced in large quantities. This is only possible if the manufacture of each individual component is watched continuously and every unusable part rejected immediately. This checking begins with the examination of the in-coming raw materials, continues through innumerable intermediate tests and ends with the extremely exhaustive final testing of the completed lens.

The following account is principally concerned with describing the optical testing of the prototype and the final examination. The controls made during the process of manufacture, which are chiefly concerned with mechanical dimensions, will not be described, with the exception of checking the specifications of the raw glasses and the measurement of the radius of curvature. We will attempt to describe the various measuring processes as seen from the general point of view, so as to make the accounts of the different techniques as short as possible.

This survey of testing procedures for photo-

Cont. page 4

Testing Lenses cont. from page 3
graphic lenses cannot claim to be complete; there are so many methods of measurement, that only those which seemed most suitable for the present purpose have been selected. This general data can easily be adapted to suit other circumstances, and can be used with respect to enlarging and projection lenses, etc. Only the most important details are given of special techniques, or of the preparation of the measuring instruments. If such information is required there is plenty of literature available.

It is most desirable that some indication of the degree of accuracy obtainable should be available in every measuring process. In most cases the accuracy of measurement depends on the apparatus used, and the usefulness of all techniques stands or falls by the performance of the equipment used for determining the measurements.

Finally, some details are given concerning the interpolation of individual examination procedures in the course of the testing sequence.

Measurement of Computation Data

Introduction

The computation figures which must be verified are: the refractive index of the glass for various wavelengths of light, the radius-of-curvature of the lens surfaces, the thicknesses of the elements and their spacing. Since these values cannot be measured on the completed lens without dismantling or even destroying it, the individual components must be checked accurately during manufacture. The values for the glass will be measured by selecting random samples from the incoming raw optical glass, and if a lens element should actually be made from the wrong type of glass, it will be noticed that the optical constants - back focus and focal length - are incorrect and that a sharp image cannot be obtained. The radii of curvature of the lens elements are checked during polishing by means of a specimen lens, so that variations in radius will be very small. It goes without saying that these specimens must themselves be measured with the utmost accuracy.

Refractive Index and Colour Dispersion of Glasses

General

The mean refractive index used for designating a type of optical glass, i.e., the refractive index n_d for the d-line ($\lambda = 587.6$), and the mean color dispersive power is indicated by the Abbe number.

$$v_d = \frac{n_d - 1}{n_F - n_C}.$$

Here, n_F and n_C are the refractive indices for the spectral lines F ($\lambda = 486.1$) and C ($\lambda = 656.3$). Nowadays, these three lines are generally replaced by 3 others: e ($\lambda = 546.1$), F' ($\lambda = 480.0$) and C' ($\lambda = 643.8$), since these lines can be produced easily with a single mercury-cadmium spectral lamp.

In order to determine these values, the refractive index of the glass must be measured at different wavelengths. The most important measuring techniques will be described in principle; for details of the many methods employed, reference should be made to the ample literature available.

All methods make use, in some way, of the refraction formula.

$$n_0 \sin a_0 = n \sin a.$$

It is also necessary to know the refractive index of whatever material is adjacent to the sample of glass. Then all techniques lead to the point where two more angles must be measured.

Methods involving a Spectrometer

Measuring Equipment

The most accurate values will be obtained by spectrometer measurement, although this method is also the most tedious.

The piece of glass, the refractive index of which is to be measured, should be in the form of a prism; the two surfaces through which the light enters and leaves must be polished plane, and the angle of the prism should be about 60° . In any event, the light should not fall at too slanting an angle on to the surface of the prism, or faults in the polishing will become too apparent.

The spectrometer consists of a collimator with a slit, a rotating table with graduated scale for the prism, and also a telescope which can be rotated about the axis of the prism table, with its ocular cross-hair focused upon the image of the collimator slit. When illuminated by true monochromatic light or by a discharge lamp, this apparatus provides a line spectrum.

(Cont. next issue)

Space Pioneer cont. from page 10
1918. The demonstrations were successful, but a few days later the Armistice ended the war and the Army shelved the weapons. It was not until World War II that Goddard's projectile rocket, available in 1918, was dusted off and emerged as the now-famous "bazooka".

For the most part, Goddard's tireless work during the Twenties attracted little interest. But toward the end of the decade, what may yet prove to be the most momentous rocket shot in history took place.

On July 17, 1929, in a field near Auburn, Mass., Goddard fired a liquid fuel rocket whose repercussions, much wider than the quiet professor wished at the time, will be felt for centuries.

The 11-foot rocket rose with a roar to a height of 90 feet, nosed over, and traveled horizontally for 171 feet before returning to earth. It was a successful shot, and Goddard was pleased. Not so the town-folk living nearby. In a dispatch the next morning the Times reported:

"The noise was such that scores of residents called Police Headquarters saying that an airplane was shooting along afire. Two police ambulances scoured the section looking for victims, and an airplane left Grafton Airport to aid the search."

Another paper headlined its story, "Moon Rocket Misses Target by 238,799 1/2 Miles."

The distressed professor also found himself under investigation by the Massachusetts State fire marshal, who frowned on further shots with such an infernal device.

Luckily, one of those who read of this fateful shot was Charles A. Lindbergh. The imagination of the nation's No. 1 hero of the day was stirred sufficiently to bring him to Worcester.

Deeply impressed, he reported what he had seen and heard to his friend Harry F. Guggenheim, a Navy flier in World War I, and President of the Daniel Guggenheim Fund for the Promotion of Aeronautics, endowed and named for his father, Daniel Guggenheim, who was an ardent supporter of aviation research and development. As a result Daniel Guggenheim granted Dr. Goddard funds which enabled him to buy badly needed equipment and take a two-year leave from Clark to

carry on his work.

Early in 1940, he offered to place all his research and patents at the U. S. Government's disposal. The Army representative replied: "All very interesting, but we don't think rockets will play any part in this war; we believe that this war is going to be fought with the trench mortar."

However, the representatives of Naval Aviation and the Army Air Corps said they thought there might be a specialized field in which Dr. Goddard's work could be useful -- jet-assisted takeoffs. And throughout the war Dr. Goddard was almost entirely restricted to the development of JATO for the Navy and the Army Air Corps.

As we know now, the Germans at this time were well advanced in developing what ultimately became the V-2 rocket. But the irony of this situation only became apparent four years later.

"In December, 1944, a few months after the V-2 began falling on London, Goddard visited me at Mercer Field, New Jersey, where I was then stationed as commanding officer of a Naval Air facility," Mr. Guggenheim recounts. "He gave me a photograph of one of his pioneering liquid fuel rockets taken in the Spring of 1941, and pointed out the features in common with the V-2. I was so startled by the similarity that I turned the photograph over and asked him to put a brief inscription on its back. Dr. Goddard wrote: 'Rocket produced in new Mexico in the spring of 1941, under the Daniel and Florence Guggenheim Foundation. It is practically identical with the German V-2 rocket.'"

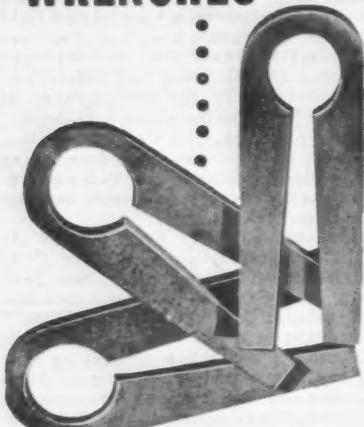
Thus, by the Spring of 1941 Goddard had succeeded almost singlehandedly in building a rocket nearly identical with that which the Germans, working since 1929 on military rockets as an official Army project, developed about 18 months later. This rocket is now on display at the National Air Museum of the Smithsonian Institution in Washington, D.C.

Robert Goddard died on August 10, 1945, after a throat operation. If ever a man had the right in his last days to say to his fellow countrymen, "I told you so," it was Goddard. But he was not the man to hurl recriminations for the apathy that had greeted his own work. His concern lay, rather, in doing what he could to make sure that those who followed would not be sim-

Cont. page 20

Nat Line:
Flexi-Clamp

WRENCHES



1751-12P \$3.50 ea.

THESE WRENCHES are very effective tools for removing Lens and Retaining Rings that do not have built in Spanner Slots. You will not mar fine finishes or damage delicate lens mounts when you have a set of these wrenches in your kit. Available for any size diameter job. SIZES IN STOCK to fit:

EASTMAN KODAK LENS CELLS
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LEICA View and Rangefinder caps
OTHER sizes available on request
PLEASE state size or purpose required when ordering.

Popular sizes: 7/16, 1/2, 21/32,
3/4, 1-1/8, 1-1/4, 1-1/2, 1-3/4

A ServiShops PRODUCT

National Camera Repair School
Englewood, Colo., U.S.A.

BOOK REVIEW

Photographic Optics by Arthur Cox fills a real need for the photographer and camera repairman. The book deals thoroughly with the optics of photography in a language which is easy to understand. It pays to know how different lenses work and how to use them. No lens yet made is perfect, but modern lenses will behave perfectly if used with understanding.

This book helps you understand how a lens works and why, and what can be expected of it. Step by step, you move from the somewhat loose definitions of terms met with in your daily work, to explanations of the designer's difficulties, and sobering qualifications of the manufacturer's claims. The best use of lenses and their background is covered with a minimum of formulae. Basic formulae, however, are included; and to clarify the material further, there is an unusually large number of diagrams and pictures.

Particular care has been taken to omit subjects of little practical value. However, some fairly complex and highly technical subjects such as the details of coma, astigmatism, and chromatic aberrations are covered. While these subjects are matters for the optical specialist, these faults can mar the performance of a lens and no discussion of the best type of lenses can be introduced without an understanding of the nature of these possible faults.

The chapter titles in this 375 page book give you a good idea of the range covered. First, Light and Lenses are discussed. This leads to the next chapter, The Ideal Lens which is followed by The Defects in Every Lens. Then comes Basic Lens Types, Testing Optical Equipment, Aids to Better Performance, Accessories, and the final chapter, Optical Calculations. The glossary completes this very fine book for those who are interested in knowing more about optics.

Hard cover, 375 pages, \$5.75.

"It's unwise to pay too much, but it's worse to pay too little. When you pay too much, you lose a little money--that is all. When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot--it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run, and if you do that you will have enough to pay for something better."

John Ruskin

Your ServiShops

QUESTIONS...

By Clair Schmitt, Editor



? ? ? ? ? NEED HELP ? ? ? ? ?

Send your camera repair questions to the editor. You will receive a prompt reply. Names will be withheld if requested. Address your questions to: Editor, The Camera Craftsman, Box 174C, Englewood, Colorado

Q. How do I take off the speed setting dial from the Praktika camera? James Frederick

A. Remove the small screw and pointer knob (this knob lifts off). The center portion of the knob revealed is actually a nut having left hand threads. Tips should be ground for the multi-span wrench to fit the slots on the inner diameter as closely as possible in order to prevent slipping and marring the surface. Because the action of the shutter tends to tighten the left hand threads, this nut is usually quite tight and in some cases a little penetrating oil will be necessary to free the threads.

Q. How do I get into the shutter, on a Vito II camera? I have the shutter removed from the camera but cannot take off the lens. Dave Stewart

A. To disassemble the front lens cell on a Vito II camera, you will need a 1 3/16" diameter flexi-clamp wrench that is 1/8" thick. This can be made by cutting down the standard 1/4" wrench. Special 1/8" wrenches can be obtained from Servi-Shops Supply. This wrench is used to hold the black calibrated section of the lens mount between the chrome plated front knurl and the shutter cover. Holding the section with the 1 3/16" wrench, use a 1 1/8" flexiclamp wrench to unscrew the chrome portion. This may be quite tight and in some cases alcohol must be applied at the separation between these two rings to loosen the threads. The chrome ring will unscrew completely and then the black cone can be lifted from the assembly. Beneath the black cone are three adjusting screws. Removing these screws will allow the ring that includes the stops to be lifted from the front cell mount.

Cont. page 18

HELP WANTED

A card to NCRS Placement Service will bring more details about these opportunities. Include code number listed for opening that interests you

01010 Established camera store in Farmington, Mass. with growing repair department wishes to employ an additional camera repairman able to handle the more complicated types of repair work. Pay commensurate with ability.

01114 Need a good camera repairman to join our company and set-up a repair department or would consider financial support for a camera repairman wishing to start independent shop. Jacksonville, Florida.

01119 We need a camera repairman for expansion of our repair shop. We are an authorized Wollensak repair shop, Detroit, Mich.

0728 Repairman wanted to take full charge of repairs on photographic equipment. Must be able to repair all types of equipment. Tucson, Arizona.

01214 Please furnish us with the name, address, and telephone number of any of your graduates who live in the Pittsburgh, Pa. area and are available for employment. We are willing to consider an advanced student.

0817 Additional camera repairman needed for large centrally located, repair shop. Desire graduate of National Camera Repair School, Detroit, Mich.

088 Want good repairman for our shop. Real opportunity for the right man. San Francisco, California.

121 Our company would appreciate applications from graduates of National Camera Repair School. North Hollywood, California.

01010 Well equipped modern shop needs two camera repairmen. Out-of-town inquiries invited. Top wages. New York, N.Y.

01011 Jacksonville, Florida firm needs experienced, bondable repairman to specialize in tape recorders and 16 mm sound projectors. Will consider someone willing to relocate.

Dealers --- Repairshops --- Service Departments

When you need repairmen, send details to NCRS Placement Service. Your needs will be listed here. Applications of interested repairmen will be sent for your consideration.

Lindstrom
* PLIERS



FLAT NOSE PLIERS

Size 4" 4½" 5"
Bright finish Cut jaws \$1.90 \$2.05 \$2.25
Bright finish Slip jaws 1.90 2.05 2.25



HALFRound NOSE PLIERS

Size 4" 4½" 5"
Bright finish Smooth jaws \$2.10



END CUTTING NIPPERS

Length 3½" 4" 4½" 5"
Bright finish \$2.25 \$2.25 \$2.50 \$2.80



ROUND NOSE PLIERS

Size 4" 4½" 5"
Bright finish Slip jaws \$1.80 \$2.05 \$2.25



CHAIN NOSE PLIERS

Size 3½" 4" 4½" 5"
Bright finish Cut jaws \$1.85 \$2.00 \$2.25
Bright finish Slip jaws 1.85 2.00 2.25 2.50



SIDE CUTTING NIPPERS

Size 3½" 4" 4½" 5"
Bright finish \$2.25 \$2.25 \$2.50 \$2.80



A ServiShops PRODUCT



Hi There!

from Jan VanderBeek

First off I want to thank all of you for your nice welcoming cards and letters. It sure helps in making a person feel at home in a strange place, especially after having such a big warm place to fill. Delphine had kind of made a home in each one of your hearts I'm sure and you'll never forget her and her charming personality.

Everything is about the same here at NCRS, we had a good year last year and can see progress springing up around us, which of course we strive for. It's so nice to see the new students coming in all the time and joining our family. We have a couple of new people on our staff also, which I'm sure you'll be aware of as you write and receive answers with different signatures and initials. Joy, Mr. Love's new secretary, is just like her name, with a cheerful smile and friendly word for everyone. Course, she has two teenagers so I suppose one has to stay on the "very understandable" side with them around to give a good deal of help. There's George, from Texas no less, with a sense of humor that is unmistakably Texan, who will be wrapping lesson packages and working with mailing. So, if an article is missing "maybe George did it"! Along with the new help, the text books are being revised so some of you may not have received certain ones, but be patient with us and you can be sure they will be the latest and best. Just to please the upcoming Camera Repairmen of the future!

To get off the business end of things, it's brrr chilly this morning here and yet one day last week we had higher temperature than Phoenix, Arizona and that's something to brag about! So Colorado is living up to its title all the time "the most changeable weather you ever saw" or maybe that is something "someone else" thought of! Well, anyway I hope that some of you people come out to Colorado on vacation and look us up while you're here and see for yourself. You'll never be sorry I'm sure, why else do so many Minnesotan's and Texan's and other people (?) stay. No reflection on anyone here.

Well, just a little thought in passing, until next month, "if life hands you a lemon, add some sugar and make some lemonade"!

Our Students Speak

This is a very good lesson in knowing what can happen to a negative, and what to do to correct the trouble. Every lesson I have completed has given me knowledge in a mechanical sense, and many times has helped me to improve my photographic standards and practices. Now I have only one more lesson to complete the course, and I'm very thankful for having started my training a year ago last month.

Jimmy L. Luth
Visalia, California

Just a note to tell you how much I have enjoyed my course in Camera Repair. I have not as yet completed my third lesson but I find your course very stimulating and interesting. Having been out of school several years, I found remembering what I have read as a challenge—but when asked a question I surprise myself as well as others as to how much I really do know. Thanks to the well written and composed course.

Laurence R. Nisbet
Redmond, Oregon

I want to thank you for making this course so clear and to the point that with only a few minutes of study each evening, a student can still learn and progress.

I could kick myself now for not starting this course a year ago when I first saw it advertised.

Walter J. Wilkins
No. Dighton, Massachusetts

I really enjoyed my stay at the school, and meeting such a nice bunch of people, besides learning some things that are important to my training in camera repair.

Charles Attaway
Bisbee, Arizona



1 SPIRAL SPRING BELTING

Furnished in 3 foot lengths complete with coupling. Runs smooth and noiseless.

No. 11-130

Each \$0.50

2 PLASTIC FUSIBLE BELTING

Ends fuse when heated to form endless belt.

No. 11-174. $\frac{3}{8}$ " diam.—Per Ft. \$0.15
No. 11-175. $\frac{1}{2}$ " diam.—Per Ft. .15
No. 11-176. $\frac{5}{8}$ " diam.—Per Ft. .15



RUST REMOVER

4 oz. bottle\$1.70

H-R Rust Remover is non-acid, absolutely harmless to the polished finish of fine parts. You may leave parts in this rust remover overnight. You may dip parts directly into the wide mouth 4 oz. bottle.



HARD ARKANSAS MOUNTED STONES

Length	Width	Each
$\frac{3}{8}$ "	$1\frac{1}{2}$ "	\$3.00
$\frac{1}{2}$ "	$1\frac{1}{2}$ "	7.50
$\frac{5}{8}$ "	$1\frac{1}{2}$ "	9.00
$\frac{6}{8}$ "	$1\frac{1}{2}$ "	10.50

HARD PENKNIFE PIECES
(Approx. $\frac{1}{2}$ the thickness of regular stones)

1.95

SERVISHOPS HEADQUARTERS ARE YOUR SPECIALISTS

ServiShops Headquarters advertising is beginning to appear in National magazines. Rely on your Headquarter Shops to back up your own work. For example, electronic specialists and complete facilities here can take care of your repairs on sound equipment, electronic flash and other specialized photographic machinery.

Send repairs direct to ServiShops Headquarters, Box 174 ER, Englewood, Colorado.

KENNEDY *all steel tool kits*



Positive spring stop prevents accidentally pulling drawer all the way out of cabinet. Spring catch can be released for quick removal of drawer.

The Kennedy line offers outstanding economy and value when fine tools are to be stored. Solidly built -- reinforced by inside walls, which ensure rigidity and also support the drawers. The Model 520 has seven drawers sized to fit a wide variety of small tools. Compound drawer slides are equipped with positive stops which prevent spilling. Patented spring catches make it easy to remove drawers. All drawers are completely felt lined and can be drawn out their full length for a clear view. Slides work easily and smoothly without sagging even when heavily loaded. Adjustable partitions in each drawer except the bottom one.

Front panel slides underneath drawers when box is in use -- friction catch holds it there. Fits outside, holding drawers closed for carrying (lacks with lid lock). Bright zinc plated fittings make attractive combination with brown ripple baked enamel finish. Dimensions: 20 x 8-1/2 x 13". Weight 27-3/4 lbs.

Till in Top	20 x 8-3/8 x 3-3/4
Four Drawers	8-5/8 x 7-1/2 x 1
One Drawer	8-5/8 x 7-1/2 x 2
One Drawer	10-1/4 x 7-1/2 x 1-1/2
Bottom Drawer	10-1/4 x 7-1/2 x 2-1/4

MODEL 520 \$31.95

The #620 chest has the same rugged construction and time-saving convenience features as the #520 described above. Equipped with three drawers -- top one has four adjustable partitions. Dimensions: 20 x 8-1/2 x 13". Weight 26 lbs.



MODEL 620

\$25.95

Till in Top	20 x 8-3/8 x 3-1/4
Top Drawer	10-1/4 x 7-1/2 x 1-3/8
Middle Drawer	10-1/4 x 7-1/2 x 2-3/8
Bottom Drawer	10-1/4 x 7-1/2 x 3-1/4

A ServiShops PRODUCT

WEST GERMAN MANUFACTURERS

There are two different photographic manufacturers in West Germany today which carry on the Zeiss name and traditions. The first is the Carl Zeiss optical works of Oberkochen (Wuerttemberg). Founded in 1846 at Jena (now part of Soviet-occupied East Germany), this company was transferred to its present site at the start of the Russian occupation in 1945. In addition to making photographic lenses and other optical elements, Carl Zeiss produces ophthalmic lenses, binoculars, microscopes, a large variety of scientific equipment, and the famous Zeiss planetarium projector.

The other company is Zeiss-Ikon A. G. of Stuttgart, famous for still and motion picture cameras, slide and cine projectors and related photographic accessories. Zeiss-Ikon had originally been situated in Dresden (now East Germany) from the time of its founding in 1926 (the result of a merger of 22 manufacturing companies including Goerz, Ernemann, Ica, Contessa, and others). It now includes plants in Kiel and West Berlin as well as the large factory of the former Contessa-Nettel works in Stuttgart.

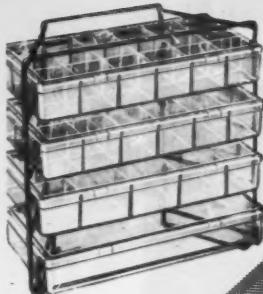
ServiShops cont. from page 15

Q. How is the shutter removed from an Illoca Rapid camera? This has a helical focusing mount and I can find no way to remove the shutter.

John Edwards

A. Remove the focusing knobs and the metal scale band. At approximately 5 o'clock, under the band you will see a hole in the slot. Look into this hole and discover a screw that has no head but has the shank cut away to form a half-round shaft. Turn the focusing mount counter clockwise as far as it will go (so lens moves out) -- loosen (one to two turns only) this screw. Turn mount clockwise (shutter should not move in) to the infinity stop and tighten the screw -- again turn lens out, etc.. Continue until the focusing barrel is removed from the helical mount. Be sure to time the threads so you can re-assemble accurately. The same system is used to re-assemble and focus. You will readily see how the dis-assembly of the shutter is made after it is removed. Caution -- be sure to study the operation of the wind mechanism thoroughly before re-assembling the shutter.

A special wrench is available from ServiShops Supply for loosening the peculiar screw. This same type of mount is used on other cameras bearing the names; Tower 51, Realist and Photrix.



(a \$3.95 value)



You've asked for them and here they are!



KITS NOW AVAILABLE:

* When TransRak is not ordered, these kits include a P 201 Plastic tray for storing.

*RIVET ASSORTMENT	\$7.50
*WIND ASSEMBLY ASSORTMENTS	
For Box Camera	\$6.95
For Popular Priced Folding Camera	\$6.95
*SYNCH INSTALLATION KITS	
External (Connectors, Insulators, etc.)	\$9.75
Internal (Replacement Parts, contact material, etc.)	\$15.50
*SHUTTER BLADE ASSORTMENT	\$6.95
FLASHCORD ASSORTMENT (6 cords)	\$9.90
SPRING WIRE KIT	
assorted sizes	
from .005" to .015"	\$1.00
METRIC SCREW ASSORTMENT	
(400 pieces)	\$7.50
MIRROR ASSORTMENT (6)	\$5.95

**1/4 PRICE! YOUR TRANS-RAK, SHOWN ABOVE,
COSTS YOU ONLY \$1.00 WITH ANY ServiShops
KIT ORDER TOTALING \$20.00 OR MORE.**

SYNCHRO CONTACTS P.C. 3 mm			
	to be melted into shutter	SCR 1	.75
	metal shutter closed M 8 contact pin 1/2" long	SCR 2	.75
	for Contax, Praktica, Braun and Yashica shutters spring 1/2" long metric screw M 1.6	SCR 3	1.45
	for Godda shutter etc. spring 1/2" long metal shutter closed M 6 x 85 metric screw M 1.6	SCR 4	1.25
	for small and large Contax shutters spring 1/2" long metal shutter closed M 4 x 05 metric screw M 1.6	SCR 5	1.25
	for Bell & Howell-Baldwin etc. spring 1/2" long wire 6" long metric screw M 1.6 black leather sleeve	SCR 6	2.10
	for Bell & Howell, old Bell & Howell, Bell & Howell spring 1/2" long with 2 connecting plates wire 6" long metric screw M 1.6 black leather sleeve	SCR 7	2.10
REPAIR PLUGS			
	to be glued by existence or heated. Contact pin silver plated. Directions for use attached.		
	End	Plastic	
	P.C. 3 mm male	black	SCR 13 .30
		grey	SCR 14 .30
	P.C. 3 mm female	black	SCR 15 .75
		grey	SCR 16 .75
	double prong (US household plug)	grey	SCR 17 .45
REPAIR LEADS			
	P.C. 3 mm 1/2" long, ready for mounting		
	End	Plastic	
	P.C. 3 mm male	black	SCR 18 .25
		grey	SCR 19 .20
	double prong (US household plug)	grey	SCR 20 .50

A ServiShops PRODUCT
NATIONAL CAMERA REPAIR SCHOOL

Meet Fred Platts

YOUR NEW ASSISTANT EDITOR



Fred used to manage a photographic studio; but what with taking pictures, developing pictures, and selling customers; Fred says he didn't do much managing. Fred likes to recall the introduction of "strob" lights. The first studio "strob" lights had condensers that accumulated an electrical charge of 50,000 volts. This accumulated charge produced the bright flash when the shutter was tripped. It worked real fine except every now and then one of the condensers gave out producing a large bang caused by 50,000 volts of electricity.

What with this and a faulty shutter it was natural that Fred would get interested in the photographic repair business.

Fred studied business in college and would be very glad to help you with your business problems. Such things as how to increase the income from your shop, are right up his alley. Write Fred and he will answer you in the Craftsman or write you a personal letter.

Space Pioneer cont. from page 13

ilarly ridiculed and ignored.

A number of memorials to Goddard's genius exist today, but the most eloquent testimonials are the modern descendants of the Goddard rocket, such as the Vanguard and Jupiter-C with which the United States sent earth satellites spinning into space.

"Tomorrow the world!" Such was the vain boast of Nazi Germany, which first incorporated Goddard's ideas about high altitude rockets into a workable weapon of war. With far more truth and modesty, a fitting epitaph for the father of space flight might well read: "Tomorrow, other worlds."



BELLOWS

Have we heard from
you lately?

Let me tell you what these lessons have done for me. Understanding and self confidence in the repair of cameras and a grand feeling of accomplishment. Why I'm not even afraid to tackle movie cameras and as you know I haven't even had one lesson on them. Just last week a friend gave me an old---movie camera---that his camera repairman said couldn't be fixed. That the gear connected to the torsion spring was bad and a section of teeth was missing and because of its age, the gear could not be purchased. Well sir, by using the technique described in NCRS lessons I disassembled this camera almost completely, raised the gear, used a small knife file to reform the teeth, reassembled it and low and behold it worked. This is only one such case of many.

Chester Preski
Pittsburgh, Pa.

I'd like to say this, all the tools I have purchased from NCRS and the ones I received with my course are of a lot better quality, better for the job and cost me less than tools I have been forced to purchase elsewhere. I'm learning a lot from the course and I believe it is more than paying for the course.

Lee E. Cates, Jr
Parsons, Kansas

Business has been fairly good and also the quality of the items in for repair has been going up. Formerly, out of five or six repair jobs, only one would be valued at more than \$50.00. Now out of five or six jobs, only one will be under \$50.00 value of the camera.

Glen E. Gale
Big Spring, Texas

A Complete SHEET METAL SHOP For Less Than \$20 Per Unit!

18" Bending and Forming Brake

- * Forms up to 90°
- * Box-brake Slots
- * Easy Adjustments
- * Handles up to 16 ga. stock



Fantastic low price makes it easy for you to have a well equipped shop!



Notching and Nibbling Unit

- * Available with 1 x 1" 90° Notch Die or 1 x 3/4" Nibbling Die

* Dies easily interchanged

indispensable at this low cost for rush and special jobs---Makes accurate burr-free notches.

Mod. N-Notching Unit** Mod. N2-Nibbling Unit
Either die separately --- \$8.00

4 in 1 Tool

1. Punches	2. Forms
3. Shears	4. Rivets

- * Throat depth handles up to 1" width, 16 ga. stock
- * Stationary die plate eliminates danger of damage to the punch and work.



Round out your repair department sheet metal shop with this versatile low-cost tool!

FORM - smooth, sharp bends to 90°— metal rods or bars!

RIVET - any type of solid or hollow rivet!

PUNCH - 1/3, "5/32," 3/16," 1/32," and 1/4" round burr - free holes up to 1" from edge.

SHEAR - 16 ga. metals at any angle; takes rod & wire tool

THESE SIMPLE, YET RUGGED TOOLS
DO THE WORK OF EQUIPMENT
COSTING MANY TIMES MORE!

SERVISHOP PRODUCT GUARANTEE

When you purchase a ServiShops product, you are sure you're getting the best of equipment. Every product advertised in the Camera Craftsman carries three warranties.

First, you have a ten-day return for refund privilege. If, for any reason, you're not satisfied, you can return your order within 10 days of purchase, for a full refund.

Second, all materials and workmanship of NCRS manufactured products are guaranteed by NCRS for one full year. NCRS will replace any parts or components which might become defective in normal use, if returned to the factory, transportation charges prepaid, within one year of original purchase.

Third, all products and parts handled by NCRS are guaranteed by the individual manufacturers of those products.

National Camera Repair School further guarantees to check and service any Servi-Shops product no longer within the warranty period, at nominal charge.

NCRS ORDER BLANK

Date 19

You can order any product advertised in the Camera Craftsman. All products carry the NCRS Return Privilege Guarantee -- Satisfaction or return in 10 days for complete refund!

Shipments are F.O.B. Englewood (Denver), Colo.

Acct. No. _____

How shall we ship? How will you pay?

Parcel Post Cash

Railway Express C. O. D.

Other _____

Name _____

Street _____

City _____ State _____

Quantity	Name and Description	Price

NOTE: Minimum order - \$2.00

Signature _____



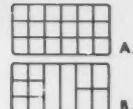
The new ServiShops Auto-Collimator. Rapidly checks focus of all types of cameras from fixed-focus to full-focusing. A twist of the focus ring varies the setting from a few feet to infinity for calibration of focusing scales. A test is completed in eight seconds, with or without film.

Handy PLASTIC BOXES

These crystal-clear boxes, 8-1/4" x 4-1/4" x 1-1/4" are molded of clear polystyrene, a light hard plastic which retains its polish well. Very handy for storage of nuts, bolts and even fishing tackle.



3 for \$2.00
75¢ each



Please designate
type desired.

A ServiShops PRODUCT

National Camera Repair School
Englewood, Colo., U.S.A.

request for
information ...

NATIONAL CAMERA REPAIR SCHOOL

Box 174
Englewood, Colorado

I am interested in the opportunities and advantages of a career in Camera Craftsmanship. Please furnish me with complete information about your training program.

Name _____ Age _____

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If you have a friend or relative who may be interested in the money making opportunities that exist today in the camera repair field, have him or her fill out this coupon and mail it to the National Camera Repair School, Box 174, Englewood, Colorado.

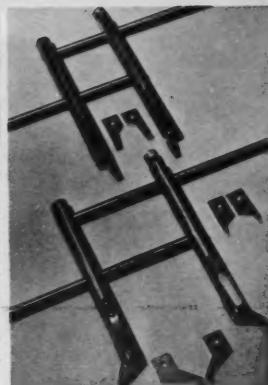
751-1

MULTISPAN WRENCH

\$8.50

Here is the precision spanner wrench designed especially for optical and camera work. It will serve you economically, for the tool accepts replaceable and interchangeable tips. Quickly adjustable from 0" to 4" (even more with proper tips), you lock the setting firmly with a single motion. The MultiSpan's versatility is unmatched because of the many varieties of tips you can use. You can instantly snap a tip for almost any application into one of two positions. Get a complete set of tips which you can use in pairs or in combination with each other.

Blanks with the tip unground are also available. These tips are already heat treated, and plated. You can grind the blade to the required shape for many of the hard-to-get-at retaining rings. Prices shown are per pair.



751-2 Tips, straight, flat, ground 1.60
 751-3 Tips, straight, pencil point 1.60
 751-4 1/8" offset, flat, ground 1.80
 751-5 1/4" offset, flat, ground 1.80
 751-6 3/8" offset, flat, ground 1.80

751-2u Tips, straight, flat, unground 1.30
 751-3u Tips, straight, point, unground 1.30
 751-4u Tips, 1/8" offset, flat unground 1.50
 751-5u Tips, 1/4" offset, flat unground 1.50
 751-6u Tips, 3/8" offset, flat unground 1.50

751-15 A Special Spanner Wrench for removing narrow shutter retaining rings on the Retina and Karat cameras



\$8.50

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